

27. (New) The ceramic heater to be used in semiconductor industry according to claim 25, further comprising at least one bottom hole in a bottom surface of said ceramic substrate.--

REMARKS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 1-27 are presently active in this case. The present Amendment amends Claims 1-24; and adds new Claims 25-27. The above amendment shows the amended claims in clean form, the attachment shows a marked up copy for the Examiner's convenience.

In the outstanding Office Action, Claims 1-4, 7, 9-11 and 14-16 were rejected under 35 U.S.C. § 102(b) as being anticipated by Morita et al (U.S. Patent No. 5,118,983). Claims 1, 2, 4, 7, 8, 10, 14, 16, 19, 21 and 24 were rejected under 35 U.S.C. § 102(b) as being anticipated by Allen (U.S. Patent No. 4,057,707). Claims 3, 9, 11, 15 and 20 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Allen, in view of Lorenze et al (U.S. Patent No. 4,960,978) or Kicherer (U.S. Patent No. 4,527,050). Claims 5, 6, 12, 17, 18, 22 and 23 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Allen, in view of Ishiguro (U.S. Patent No. 5,321,386) or Paquet et al (U.S. Patent No. 5,822,675). Claim 13 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Allen, in view of Lorenze et al or Kicherer as applied to claim 3 and further in view of Ishiguro or Paquet et al.

Initially, Applicant respectfully requests that the Information Disclosure Statement filed November 19, 2001, along with the Form PTO 1449 listing references cited in the International Search Report, be acknowledged as having been considered. The Notice of

Acceptance mailed November 28, 2001 indicates that the references cited in the International Search Report have been received for this case by the USPTO.

In order to clarify Applicant's invention and to vary the scope of protection recited in the claims, new Claims 25-27 are added. New Claims 25-27 find support in the disclosure as originally filed. Specifically, Claims 25-26 find non-limiting support at page 6, lines 9-12 with corresponding Fig. 2 showing through hole 15, and lifter pin 16 supporting semiconductor wafer 19 at a distance above the ceramic substrate 11. Claim 27 finds non-limiting support at page 6, lines 12-14 with corresponding Fig. 2 showing bottom hole 14 in the bottom surface 11b of the ceramic substrate 11. Therefore, new Claims 25-27 are not believed to raise a question of new matter.¹

New Claims 25-27 are believed to be patentably distinguishing over the cited prior art because none of the references, individually or in combination, teaches or suggests the features recited in new Claims 25-27. Accordingly, Claims 25-27 are believed to be allowable.

In response to the rejections of Claims 1-24 under 35 U.S.C. § 102(b) and 35 U.S.C. § 103(a), Applicant respectfully requests reconsideration of these rejections and traverses the rejections as discussed next.

Briefly recapitulating, Applicant's invention relates to a ceramic heater to be used in the semiconductor industry, wherein a resistance heating element, which includes one or more circuits, is arranged on a surface of a ceramic substrate, and an insulating film is deposited on the resistance heating element. The claimed invention prevents changes in resistance from oxidation of the resistance heating element by oxygen in the air; or from corrosion of the

¹See MPEP 2163.06 stating that "information contained in any one of the specification, claims or drawings of the application as filed may be added to any other part of the application without introducing new matter."

resistance heating element by reactive gas. The claimed insulating film over the resistance heating element also prevents temperature drops caused by the release of heat from the face on which resistance the heating element is formed.

The above advantages are clearly demonstrated by Applicant's tables. In particular, the tables show a change of the resistance value that is 0.1 to 0.3%, i.e., a small change of the resistance value. The tables also show a temperature change with time that is 0.1 to 0.2°C, i.e., a small change indicative of the present invention's good temperature-retaining property.

In the semiconductor industry, it is preferable to evenly heat the semiconductor wafers and the like. Therefore, it is preferred to prevent temperature changes on the heating surface. As discussed above, the present invention provides these advantages and is thus well suited to be used in the semiconductor industry, as intended. To clarify this point, the claims are amended to specify that the ceramic heater of the present invention is to be used in the semiconductor industry. This amendment finds support in the disclosure as originally filed, for example at page 1, lines 6-7.

Turning now to the applied prior art, the Morita patent discloses a thermionic electron source to be used as an electron gun for a cathode ray tube, a hot cathode X-rays tube and the like.² The Morita thermionic electron source is different from the ceramic heater of the present invention, which is to be used in the semiconductor industry as recited in the amended claims. More specifically, the Morita thermionic electron source requires a porous member (electron emitting member) that emits a thermionic electron. Hence, if the Morita thermionic electron source were to be used as a heater in the semiconductor industry, the porous member would become an obstacle for evenly heating the semiconducting wafers and the like.

²See the Morita patent, for example at column 1, lines 6-17.

Accordingly, Applicant respectfully traverses, and requests reconsideration of, the rejection of Claims 1-4, 7, 9-11 and 14-16 over the Morita patent.³

With respect to the Allen patent, this reference discloses a heater for cooking,⁴ and is not a heating device to be used in the semiconductor industry, as now required by Applicant's amended claims. Unlike the ceramic heater to be used in the semiconductor field, the prevention of changes in the resistance value with time and the heat retaining property on the heating face are not required for such cooking devices. Accordingly, Applicant respectfully traverses, and requests reconsideration of, the rejection of Claims 1, 2, 4, 7, 8, 10, 14, 16, 19, 21 and 24 based on the Allen patent.

With respect to the rejection of Claims 3, 9, 11, 13, 15 and 20 under 35 U.S.C. 103(a) as being unpatentable over Allen in view of Lorenz or Kicherer, Applicant respectfully traverses this rejection as next discussed. Regarding the Kicherer patent, that reference discloses a hotplate with a ceramic substrate made of a nitride ceramic. However, the substrate in Kicherer is used for cooking and boiling.⁵ Furthermore, in the Kicherer hotplate, the protecting film is applied on the bottom of the resistance heating elements in order to protect them from mechanical damage. However, the heating elements are not covered for insulation as is in the present invention, and thus the oxidation of the resistance heating element and resulting change of the resistance value thereof cannot be prevented. Accordingly, the Kicherer hotplate is not used in the semiconductor industry and is different from the present invention.

³See MPEP 2143.03: "All words in a claim must be considered in judging the patentability of that claim against the prior art."

⁴ See the Allen patent, for example, the abstract and claims.

⁵See the Kicherer patent, for example, at column 1, lines 32-35, and lines 52-55.

Regarding the Lorenz patent, this reference discloses a ceramic substrate made of a nitride ceramic. However, the Lorenz device is a cooking appliance.⁶ Accordingly, the Lorenz cooking appliance is not used in the semiconductor industry and is different from the present invention.

As mentioned above, the Allen heater is different from the present invention, as now recited in the amended claims. Therefore, although Lorenz and Kicherer disclose a ceramic substrate made of a nitride ceramic, the combination of applied references fails to teach every feature recited in the amended claims.

Furthermore, the Allen, Lorenz, Kicherer references are non-analogous to Applicant's invention⁷ because these patents 1) are not in the field of Applicant's endeavor and 2) are not reasonably pertinent to the particular problem with which the Applicants were concerned.⁸ Specifically, the field of Applicant's endeavor is heating semiconductor wafers, while the field of the applied patents is cooking. Applicant is concerned with the problems of evenly heating semiconductor wafers, preventing changes in the resistance of the heating element, while the applied patents are pertinent to increasing "the life of the heating or cooking unit,"⁹ providing "a large area plate with several cooking points,"¹⁰ and ensuring "very short preliminary

⁶See the Lorenz patent, for example the abstract and claims.

⁷See MPEP 2141.01(a) stating that the "examiner must determine what is 'analogous prior art' for the purpose of analyzing the obviousness of the subject matter at issue."

⁸See MPEP 2141.01(a), quoting In re Oetiker, 977 F2d 1443, 1446, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992): "In order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned."

⁹The Allen patent, abstract, last line.

¹⁰The Lorenz patent, abstract, lines 4-5.

cooking or boiling time."¹¹ Accordingly, Applicant respectfully traverses, and requests reconsideration of, the rejection of Claims 3, 9, 11, 13, 15 and 20 based on Allen in view of Lorenz or Kicherer.

With respect to the rejection of Claims 5, 6, 12, 17, 18, 22 and 23 under 35 U.S.C. 103(a) as being unpatentable over Allen in view of Ishiguro or Paquet, Applicant respectfully traverses this rejection as next discussed. Regarding the Ishiguro patent, that reference discloses an insulating layer made of a polyimide resin. However, the Ishiguro patent describes a heat-generating resistor element for use in a thermal-type flow rate sensor.¹² The Ishiguro heat-generating resistor element is not used in the semiconductor industry and is different from the heater configured to heat a semiconductor wafer of the present invention. The element in Ishiguro is to detect the flow rate of the air by measuring the resistance value variation generated by the change of the flow rate of the air,¹³ whereas the heater to be used in the semiconductor field of the present invention is for heating a semiconductor.

Regarding the Paquet patent, Paquet discloses an insulating layer made of a silicone resin. Paquet also discloses a resistance heating element formed on the surface of a substrate through an insulation layer, at least two separate electrically conductive areas being attached to the resistance heating element, and an insulating protective top layer covering the resistance heating elements and the electrically conductive areas. However, the substrate in Paquet consists of metals such as anodized aluminum, aluminum, stainless steel, enameled steel, and copper.¹⁴ Heating such metals generate warp because of the thermal expansion of the metal.

¹¹The Kicherer patent at column 1, lines 32-34.

¹²See the Ishiguro patent, for example the abstract and the claims.

¹³See the Ishiguro patent, for example, at column 2, lines 30-54.

¹⁴See the Paquet patent, for example Claim 2.

Consequently, a clearance would be generated between the semiconductor wafer and the substrate and the distance between a semiconductor wafer and the substrate would become uneven. Therefore, evenly heating a semiconductor wafer cannot be realized with the Paquet heating element.

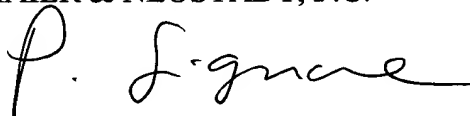
As mentioned above, the Allen heater is different from the claimed present invention, as amended. Although Ishiguro and Paquet disclose an insulating cover made of a resin, the combination of applied references fails to teach every feature recited in the claims, and Applicant respectfully traverses, and requests reconsideration of, the rejection of Claims 5, 6, 12, 17, 18, 22 and 23 based on Allen in view of Ishiguro or Paquet.

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal Allowance. A Notice of Allowance for Claims 1-27 is earnestly solicited.

Should the Examiner deem that any further action is necessary to place this application in even better form for allowance, he or she is encouraged to contact Applicant's undersigned representative at the below listed telephone number.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



Gregory J. Maier
Attorney of Record
Registration No. 25,599
Philippe J. C. Signore, Ph.D.
Registration No. 43,922



22850

(703) 413-3000
Fax #: (703)413-2220
GJM:PJCS:les

Marked-Up Copy

Serial No: 09/869,321

Amendment Filed on: 4/16/02

IN THE CLAIMS

Please amend Claims 1-24 as follows:

--1. (Amended) A ceramic heater to be used in semiconductor industry, [wherein]
comprising:

a ceramic substrate,

a resistance heating element comprising one circuit or more circuits, said resistance heating element being [is] arranged on a surface of [a] said ceramic substrate, and

an insulating covering [is] deposited on the resistance heating element.

2. (Amended) The ceramic heater to be used in semiconductor industry according to claim 1, wherein said insulating covering is deposited in a stretch containing a portion where said circuit is formed.

3. (Twice Amended) The ceramic heater to be used in semiconductor industry according to claim 1, wherein said ceramic substrate comprises a nitride ceramic or a carbide ceramic.

4. (Twice Amended) The ceramic heater to be used in semiconductor industry according to claim 1, wherein said insulating covering comprises oxide glass.

5. (Twice Amended) The ceramic heater to be used in semiconductor industry according to claim 1, wherein said insulating covering comprises a heat resistant resin material.

6. (Amended) The ceramic heater to be used in semiconductor industry according to claim 5, wherein said heat resistant resin material is one or more selected from a polyimide resin and a silicone resin.

7. (Twice Amended) The ceramic heater to be used in semiconductor industry according to claim 1, wherein the opposite side to the side where said resistance heating element is formed is a heating surface.

8. (Twice Amended) The ceramic heater to be used in semiconductor industry according to claim 1, wherein said insulating covering covers the resistance heating element comprising two or more circuits in a lump.

9. (Amended) The ceramic heater to be used in semiconductor industry according to claim 2, wherein said ceramic substrate comprises a nitride ceramic or a carbide ceramic.

10. (Amended) The ceramic heater to be used in semiconductor industry according to claim 2, wherein said insulating covering comprises oxide glass.

11. (Amended) The ceramic heater to be used in semiconductor industry according to claim 3, wherein said insulating covering comprises oxide glass.

12. (Amended) The ceramic heater to be used in semiconductor industry according to claim 2, wherein said insulating covering comprises a heat resistant resin material.

13. (Amended) The ceramic heater to be used in semiconductor industry according to claim 3, wherein said insulating covering comprises a heat resistant resin material.

14. (Amended) The ceramic heater to be used in semiconductor industry according to claim 2, wherein the opposite side to the side where said resistance heating element is formed is a heating surface.

15. (Amended) The ceramic heater to be used in semiconductor industry according to claim 3, wherein the opposite side to the side where said resistance heating element is formed is a heating surface.

16. (Amended) The ceramic heater to be used in semiconductor industry according to claim 4, wherein the opposite side to the side where said resistance heating element is formed is a heating surface.

17. (Amended) The ceramic heater to be used in semiconductor industry according to claim 5, wherein the opposite side to the side where said resistance heating element is formed is a heating surface.

18. (Amended) The ceramic heater to be used in semiconductor industry according to claim 6, wherein the opposite side to the side where said resistance heating element is formed is a heating surface.

19. (Amended) The ceramic heater to be used in semiconductor industry according to claim 2, wherein said insulating covering covers the resistance heating element comprising two or more circuits in a lump.

20. (Amended) The ceramic heater to be used in semiconductor industry according to claim 3, wherein said insulating covering covers the resistance heating element comprising two or more circuits in a lump.

21. (Amended) The ceramic heater to be used in semiconductor industry according to claim 4, wherein said insulating covering covers the resistance heating element comprising two or more circuits in a lump.

22. (Amended) The ceramic heater to be used in semiconductor industry according to claim 5, wherein said insulating covering covers the resistance heating element comprising two or more circuits in a lump.

23. (Amended) The ceramic heater to be used in semiconductor industry according to claim 6, wherein said insulating covering covers the resistance heating element comprising two or more circuits in a lump.

24. (Amended) The ceramic heater to be used in semiconductor industry according to claim 7, wherein said insulating covering covers the resistance heating element comprising two or more circuits in a lump.

Please add new Claims 25-27 as follows:

--25. (New) The ceramic heater to be used in semiconductor industry according to claim 1, wherein said ceramic substrate is thermally coupled to a semiconductor wafer.

26. (New) The ceramic heater to be used in semiconductor industry according to claim 25, wherein:

said ceramic substrate defines at least one through hole, and

said ceramic heater further comprises:

a lifter pin inserted through said through hole, said lifter pin being configured to support said semiconductor wafer at a distance above said ceramic substrate.

27. (New) The ceramic heater to be used in semiconductor industry according to claim 25, further comprising at least one bottom hole in a bottom surface of said ceramic substrate.--

I:\atty\pjcs\8011.PJCS\211598US\211598.am.wpd